

DOCUMENT RESUME

ED 299 543

CS 009 345

AUTHOR Whitt, Mary F.
TITLE The Metacognition Process and Its Relationship to
Reading, Problem-Solving and Comprehension
Instruction for Developmental Students in
Institutions of Higher Education.
PUB DATE Apr 88
NOTE 17p.
PUB TYPE Information Analyses (070)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Academic Achievement; *Comprehension; Content Area
Reading; Higher Education; Learning Strategies;
Literature Reviews; *Metacognition; Problem Solving;
Reading Research; *Remedial Reading
IDENTIFIERS Reading Uses

ABSTRACT

A review of current research on metacognition demonstrates an awareness of and attention to problems developmental readers face using metacognitive skills during instruction and may serve to reduce these readers' tendency to practice improper learning behavior, thereby improving their problem-solving efforts. Transfer of problem-solving techniques to content area courses would be beneficial to any developmental education program. (Fifty-three references are appended.) (RS)

* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *

ED299543

THE METACOGNITION PROCESS AND ITS RELATIONSHIP TO READING,
PROBLEM-SOLVING AND COMPREHENSION INSTRUCTION FOR
DEVELOPMENTAL STUDENTS IN INSTITUTIONS OF HIGHER EDUCATION

"PERMISSION TO REPRODUCE THIS
MATERIAL HAS BEEN GRANTED BY

Mary Whitt

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)."

U. S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

- ☐ This document has been reproduced as received from the person or organization originating it.
- ☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

BY

DR. MARY F. WHITT

APRIL, 1988

OS009345

THE METACOGNITION PROCESS AND ITS RELATIONSHIP TO READING,
PROBLEM-SOLVING AND COMPREHENSION INSTRUCTION FOR
DEVELOPMENTAL STUDENTS IN INSTITUTIONS OF HIGHER EDUCATION

Information-processing theories have taken various forms so that all the possible aspects as well as the very nature of cognition could be studied. The result of these theories significantly increased the number of research studies regarding the relationship of cognitive skills to reading comprehension and instruction for developmental education. The interaction between cognitive style and reading skill development took on greater importance as a research effort because of the need for better communication as well as improvement in analytical thinking during these computer literacy times. Apparently, how one reasons during problem-solving activities has been one of the factors that has given impetus to a metacognitive approach to developmental education.

Although no definitive decision on the interpretation as specific or certain as to the nature of metacognition has been proposed by researchers, generally, the term has been accepted to refer to the way a person monitors his/her own reasoning or thinking process. Recently, 'meta' has been ascribed to other processes and skills such as metacomprehension and metalinguistics, however, research on metacognition with reference to the monitoring of thinking activity was conducted in the past by (Huey, 1908, 1968; Dewey, 1910; and Thorndike, 1917). Those activities

involving comprehension, reasoning, reading and evaluating have now become recognized as metacognitive skills.

Metacognition may be defined as a process of analytical reasoning which enables one to understand how and why he/she responds to a particular problem through reading, mathematical calculations, statistical material or other problem-solving behavior. Metacognition, as a concept has been accorded several interpretations. Athey (1983) expressed the fact that Metacognition has become a popular topic of late and that the ability to monitor one's own cognitive activity in the course of sending or receiving messages is extremely important to effective communication. Flavell (1978) defined metacognition as "knowledge that takes as its object or regulates any aspect of any cognitive endeavor."

In discussing the relationship between metacognitive skills and effective reading (Baker and Brown, 1984) state that the ability to reflect on one's own cognitive processes, to be aware of one's own activities while reading, solving problems, and so on, is a late-developing skill with important implications for the child's effectiveness as an active, planful learner. If the child is aware of what is needed to perform effectively, then it is possible for him or her to take steps to meet the demands of a learning situation more adequately. If, however, the child is not aware of his or her own limitations as a learner or the complexity of the task at hand, then the

child can hardly be expected to take preventive actions in order to anticipate or recover from problems.

Since effective readers must have some awareness and control of the cognitive activities they engage in as they read, most characterizations of reading include skills and activities that involve metacognition. Some of the metacognitive skills involved in reading are: (a) clarifying the purposes of reading, that is understanding both the explicit and implicit task demands; (b) identifying the important aspects of a message; (c) focusing attention on the major content rather than trivia; (d) monitoring ongoing activities to determine whether comprehension is occurring; (e) engaging in self-questioning to determine whether goals are being achieved; and (f) taking corrective action when failures in comprehension are detected (Brown, 1980).

The success of metacognition and metacomprehension instruction depend upon, among other types of learning behavior, the reading and developmental education students' problem-solving abilities for academic achievement. The metacomprehension skill as it relates to student awareness of cognition requires metamethodology in learning how to learn. Rabianski-Carriuolo (1985), has suggested that students also need to be taught how to learn by all of their teachers, not just developmental specialists.

As the need increases for developmental programs, so grows the need for a comprehensive description of the skills

involved in reading since reading is the precursor to intellectual advancement.

A clarification of the reading process is made by Gates (1949):

Reading is not a simple mechanical skill; nor is it a narrow scholastic tool. Properly cultivated, it is essentially a thoughtful process. However, to say that reading is a "thought-getting" process is to give it too restricted a description. It should be developed as a complex organization of patterns of higher mental processes. It can and should embrace all types of thinking, evaluating, judging, imagining, reasoning, and problem-solving. Indeed, it is believed that reading is one of the best media for cultivating many techniques of thinking and imagining (12, p. 3).

Significance of Comprehension

Research studies conducted on the role that reading and comprehension skills play in academic achievement have been investigated by many including (McDonald, 1956; Wagner, 1956; Schleich, 1958; Perry, 1959; Lowe, 1967; Netchinsky, 1968; Belcher, 1971; Gelfand, 1972; Livingston, 1972; Skillman, 1973; Tillman, 1973; Berg, Hess, and Crocker, 1983; Vacca and Vacca, 1983; and Whitt, 1983). Although the meta-cognitive elements of cognition and comprehension have received a rebirth of attention for instructional purposes several research studies have continued to assess the enormous importance of the skill of comprehension to educational progress (Kerschner, 1964; Kintsch and Keenan, 1973; Jackson and McClelland, 1979; Just and Carpenter, 1980; Carver, 1981; Wittrock, 1981; Whitt, 1985).

Davis (1956) stressed that while instruction in the mechanics of reading is important, systematic training

should also be given in comprehension skills. A study by Whitt (1980) found that stress on specific skills, notably the comprehension skill, during instruction, would develop a higher level of proficiency in the reading skills for university developmental reading students. Kavale and Schreiner (1979) conducted a study which identified reasoning strategies used by above average and average readers in responding to standardized measures of reading comprehension. Results indicated that readers used identifiable sequences representing reasoning strategies. Other research conducted on reading strategies for comprehension included those of (Cleland, 1965; Barrett, 1968; Davis, 1968; Freedle and Carroll, 1972; Spearitt, 1972; Gibson and Levin, 1975; Perfetti and Hogaboam, 1975; Olshavsky, 1976).

Tierney & Cunningham (1984), in categorizing; (1) metacomprehension and inference training and (2) meeting the text-based needs of readers, suggest that comprehension strategies can be defined as those cognitive activities which good readers engage in to foster comprehension. Specifically, comprehension strategies might include: engaging background knowledge, goal-setting, identifying task demands, allocating attention, evaluating content, self-appraisal, self-correction, predicting, self-questioning, and so on. While the pursuit of these strategies seems a rather obvious goal of any comprehension instructional program, our review of instructional research

and programs has found only a few attempts to develop deliberate use of such strategies by readers.

Since it would be inappropriate to discuss metacognition without considering the role that problem-solving plays in contributing to its development, some thought should be devoted to this area, especially as it concerns developmental education. The importance of developmental education programs has been studied by research specialists including (Boylan, 1983; Roueche, 1983; Brier, 1984; Cross, 1984).

Relevance of Problem-Solving

Problem-solving as an integral part of instruction and learning is essential. Whimbey and Whimbey (1975), concluded that a large percentage of the high school students in "reading difficulties" have, in fact, comprehension problems. Being able to comprehend involve problem-solving skills that are lacking for many developmental education students in institutions of higher learning.

While experiencing instruction of developmental education students in developmental classes, it has been noted that these students: (a) are unable to recognize that a reading problem exists; (b) have difficulty in acknowledging the severity of their reading-learning problems; (c) most of the time will omit reading the directions for a particular reading activity; (d) frequently fail to read the introductory information preceding the

reading activity; (e) are very often unable to interpret or follow the directions for an exercise in reading; (f) are unable to comprehend the questions being asked on tests and reading exercises; (g) perceive the answer to an exercise item as a one-thought process. Introspection is lacking. No thought is given to other possible answers; (h) fail to consider the relationship between the exercise or test questions and the choices for the answers; (i) are lacking in problem-solving techniques and learning strategies; (j) lack the knowledge that problem-solving requires a variety of behaviors including the motivation to reach a needed frustration level to the point of being able to solve a problem (give up easily).

An awareness for and attention to the aforementioned problems during instruction may serve to reduce the tendency to practice improper learning behavior and therefore improve problem-solving efforts. Transfer of proper problem-solving techniques to content area courses would be beneficial to any developmental education program.

Learning specialists have conducted studies that noted specific characteristics accorded college students of varying aptitudes. Bloom and Broder (1950) conducted a study on college students with high and low academic aptitudes. After the students were tested on a series of academic reasoning problems while being asked to think aloud or introspect while solving the problems so that their thinking activities could be monitored, they were found to

show a definite consistency in their approach to solving problems. The problem-solving behavior of low-aptitude college students was characteristically different from that of high-aptitude students. Low-aptitude students were found to be mentally careless and superficial in solving problems. They often rushed through the instructions, or even skipped them, and selected a wrong answer because they failed to comprehend what was required. When asked to reread the instructions more carefully, frequently they understood them and proceeded correctly. Typically, they did not peruse the instructions thoroughly on their own, but were satisfied with an incomplete understanding. In actual problem solving, low-aptitude students were almost completely passive in their thinking. They spent little time considering a question, but chose an answer on the basis of a few clues. Frequently, the selection was founded on simply a feeling, an impression, or a guess. High-aptitude students, by contrast, made a decidedly active attack on problems. When a question was initially unclear, they often employed a lengthy sequential analysis in arriving at an answer. They began with what they understood of the problem, drew on other information in their possession to clarify the question further, and carefully proceeded through a chain of steps that finally brought them to a solution.

Bloom and Broder (1950) also found in the study conducted from 1945 to 1950, that low-aptitude students were

unable to take an objective view of a question--a tendency for their subjective opinions to intrude on purely logical considerations. They also placed little value on reasoning as a method of problem-solving. They did not see problems as susceptible to analysis. Their orientation was not to attack a complex problem by breaking it down into subproblems: Either they knew the answer to a problem or they didn't; and if they didn't, they made a cursory evaluation and then guessed. A remedial training program (a pilot project) was developed as a result of these findings. Other research investigations have addressed characteristics of learning behavior including (Piaget, 1947; Bereiter and Engelmann, 1966; Guilford, 1967).

A study was conducted on college students who were taught to solve reasoning problems. This study indicated that the ability to solve a certain type of reasoning problem could be improved by training (Whimbey and Whimbey, 1975). This and other such research studies have led to the production and publication of instructional materials designed to encourage metacognition. These instructional materials include: Analytical Reading and Reasoning by Dr. Arthur Whimbey (1983); Mastering Reading Through Reasoning by Dr. Arthur Whimbey (1985); and Problem Solving and Comprehension by Arthur Whimbey and Jack Lockhead (1986).

The implications for this article suggest that metacognition as it relates to reading, problem-solving and

comprehension instruction, through the continued practice of research theories, will gain prominence as time goes by. Reaping the benefits of these efforts will be the products of today and producers for tomorrow—developmental education students as well as any of those persons requiring the metacognition process which leads to intellectual advancement and effective communication.

REFERENCES

- Athey, I. "Future Research in English Education: Vital Factors and Research Paradigms." English Education, vol. 15, no. 4 (1983), pp. 217-230.
- Baker, L., and Brown, A. L. "Metacognitive Skills and Reading." In Handbook of Reading Research, edited by P. David Pearson. New York, N.Y.: Longman, 1984.
- Barrett, T. "What is Reading? Some Concepts." In Innovation and Change in Reading Instruction, edited by H. Robinson. Yearbook of the National Society for the Study of Education, 1968.
- Belcher, M. J. "The Effect of Increased Reading Efficiency Upon Semester Grade Point Averages." Journal of Reading, vol. 14 (1971), pp. 381-384.
- Bereiter, C., and Engelmann, S. Teaching Disadvantaged Children in the Preschool. Englewood Cliffs: Prentice-Hall, 1966.
- Berg, P. C., Hess III, R. K., and Crocker, A. "The Contribution of Reading Research to College Reading Programs." Forum for Reading, vol. 14, no. 1 (1983), pp. 17-29.
- Bloom, B., and Broder, L. Problem-Solving Processes of College Students. Chicago: University of Chicago Press, 1950.
- Boylan, H. R. Benefits of Developmental Education and Learning Assistance Programs. Information Bulletin No. 1, National Association of Remedial/Developmental Studies in Post-Secondary Education memorandum. Greenwood, S. C.: Piedmont Technical College, January, 1983.
- Brier, E. "Bridging the Academic Preparation Gap: An Historical View." Journal of Developmental Education, vol. 8, no. 1 (1984), pp. 2-5.
- Brown, A. L. "Metacognitive Development and Reading." In Theoretical Issues in Reading Comprehension, edited by R. J. Spiro, B. C. Bruce, and W. F. Brewer. Hillsdale, N. J.: Erlbaum, 1980.
- Carver, R. P. Reading Comprehension and Rauding Theory. Springfield, IL: Charles C. Thomas, 1981.

- Cleland, D. L. "A Construct of Comprehension." In Reading and Inquiry, edited by J. A. Figurel. Newark, DE: International Reading Association, 1965.
- Cross, K. P. The Impact of the 1980's on Developmental Education. Paper presented at the Western College Reading and Learning Association annual meeting, San Jose, Calif., April 1984.
- Davis, F. B. "The Teaching of Comprehension in Reading in the Secondary Schools." Education, vol. 5026 (1956), pp. 541-544.
- Davis, F. B. "Research in Comprehension in Reading." Reading Research Quarterly, vol. 3 (1968), pp. 499-545.
- Dewey, J. How We Think. Boston: Heath, 1910.
- Flavell, J. H. "Metacognitive Development." In Structural/Process Theories of Complex Human Behavior, edited by J. M. Scandura and C. J. Brainerd. Alphen a.d. Rijn, The Netherlands: Sijthoff and Noordhoff, 1978.
- Freedle, R. O., and Carroll, J. B. "Language Comprehension and the Acquisition of Knowledge: Reflections." In Language, Comprehension and the Acquisition of Knowledge, edited by J. B. Carroll and R. O. Freedle. New York: John Wiley and Sons, 1972.
- Gates, A. I. "Character and Purposes of the Yearbook," Reading in the Elementary School. Forty-eighth Yearbook of the National Society for the Study of Education, Part II. Chicago: The University of Chicago Press, 1949.
- Gelfand, J. K. "A Study of the Effectiveness of a Reading and Study Skills Program and Academic Counseling Procedures with a Group of Summer Qualifying Students." Dissertation Abstracts International, vol. 32 (1972), pp. 6150 A-6151 A. (University Microfilms No. 72-15, 880).
- Gibson, E. J., and Levin, H. The Psychology of Reading. Cambridge, MA: M.I.T. Press, 1975.
- Guilford, J. P. The Nature of Human Intelligence. New York: McGraw-Hill, 1967.
- Huey, E. B. The Psychology and Pedagogy of Reading. Cambridge: M.I.T. Press, 1968. (Originally published, 1908).

- Jackson, M. D. and McClelland, J. L. "Processing Determinants of Reading Speed." Journal of Experimental Psychology, vol. 108 (1979), pp. 151-181.
- Just, M. A., and Carpenter, P. A. "A Theory of Reading: From Eye Fixations to Comprehension." Psychological Review, vol. 87 (1980), pp. 329-354.
- Kavale, K., and Schreiner, R. "The Reading Processes of Above Average and Average Readers: A Comparison of the use of Reasoning Strategies in Responding to Standardized Comprehension Measures." Reading Research Quarterly, vol. 15, no. 1 (1979), pp. 102-128.
- Kershner, A. M. "Speed of Reading in an Adult Population under Differential Conditions." Journal of Applied Psychology, vol. 48 (1964), pp. 25-26.
- Kintsch, W., and Keenan, J. "Reading Rate and Retention as a Function of the Number of Propositions in the Base Structure of Sentences." Cognitive Psychology, vol. 5 (1973), pp. 257-274.
- Livingston, F. B. "Some Effects of Requiring Entering Students to Enroll in a Developmental (Remedial) Program at Florissant Valley Community College." Dissertation Abstracts International, vol. 32 (1972), pp.4376A-4377 A. (University Microfilms No. 72-5300).
- Lowe, A. J. "State Survey of College Reading Improvement Services." In New Developments in Programs and Procedures for College Adult Reading, edited by R. C. Staiger & M. Culbreth. Twelfth Yearbook of the National Reading Conference, Milwaukee, WI: The Marquette University Press, 1967.
- McDonald, A. S. "An Experimental Study of the Influence of a College Reading Program on Academic Performance." Dissertation Abstracts International, vol. 16 (1956), p. 1402. (University of Microfilms No. 56-3540).
- Netchinsky, I. "The Reading Improvement Program at the State University Urban Center in Brooklyn." Journal of Reading, vol. 11 (1968), pp. 362-366.
- Olshavsky, J. E. "Reading as Problem Solving: An Investigation of Strategies." Reading Research Quarterly, vol. 12 (1976), pp. 654-674.
- Perfetti, C. A., and Hogaboam, T. "Relationship between Single Word Decoding and Reading Comprehension Skill." Journal of Educational Psychology, vol. 67 (1975), pp. 461-469.

- Perry, W. G. "Student's Use and Misuse of Reading Skills: A Report to the Faculty." Harvard Educational Review, vol. 29 (1959), pp. 193-200.
- Rabianski-Carriuolo, N. "Teaching Basic Skills to College Students." The Chronicle of Higher Education, vol. 29 (1985), p. 88.
- Roueche, J. E., ed. A New Look at Successful Programs. San Francisco, Calif.: Jossey-Bass, 1983.
- Schleich, M. "The Evolution of a College Reading Program." Unpublished Doctoral Dissertation, Teachers College, Columbia University, New York, 1985.
- Skillman, A. G. "The Effect on Mathematics Achievement of Teaching Reading in a Mathematics Class at Casper College." Dissertation Abstracts International, vol. 33 (1973), p. 4251A. (University Microfilms No. 73-2648).
- Spearitt, D. "Identification of Subskills of Reading Comprehension by Maximum Likelihood Factor Analysis." Reading Research Quarterly, vol. 8 (1972), pp. 92-111.
- Thorndike, E. L. "Reading as Reasoning: A Study of Mistakes in Paragraph Reading." Journal of Educational Psychology, vol. 8 (1917), pp. 323-332.
- Tierney, R. J., and Cunningham, J. W. "Research on Teaching Reading Comprehension." In Handbook of Reading Research, edited by P. David Pearson. New York, N. Y.: Longman, 1984.
- Tillman, C. E. "Four-year College Reading Improvement Programs and Grades: An Annotated Review, 1945-1971." Journal of Reading Behavior, vol. 5 (1973), pp. 100-109.
- Vacca, R. T., and Vacca, J. L. "Guest Editorial: Two Less than Fortunate Consequences of Reading Research in the 1970's." Reading Research Quarterly, vol. 18, no. 4 (1983), pp. 382-383.
- Wagner, M. E. Reading and College Success. Paper Read before the Division of Educational Psychology, American Psychological Association, Chicago, IL, 1956.
- Whimbey, A., and Whimbey, L. S. Intelligence Can Be Taught. New York: Dutton, 1975.
- Whimbey, A. Analytical Reading and Reasoning. Stamford, CT: Innovative Sciences, Inc., 1983.

- Whimbey, A. Mastering Reading Through Reasoning. Stamford, Ct: Innovative Sciences, Inc., 1985.
- Whimbey, A., and Lockhead, J. Problem Solving and Comprehension. Hillsdale, NJ: Lawrence Erlbaum Associates, 1986.
- Whitt, M. F. "Reading Comprehension: An Analysis for Developmental Reading Programs in Institutions of Higher Education." Unpublished Doctoral Dissertation, The University of Alabama, Tuscaloosa, 1980.
- Whitt, M. F. "The Relevance of Comprehension to General Intelligence and Reading Programs." The Learner in the Process: Dedicated to Learners of All Ages, vol. 5, no. 1 (1983), pp. 24-31.
- Whitt, M. F. "If Johnny Can Read, Why Can't He Understand?" Sand Mountain Reporter, Albertville, AL, December 10, 1985.
- Wittrock, M. C. "Reading Comprehension." In Neuropsychological and Cognitive Process in Reading, edited by F. J. Pirozzolo, & M. C. Wittrock. New York: Academic Press, 1981.